

**The Claims Defining the Invention are as Follows**

1. An apparatus for producing a multi-pulse sequence for irradiating a substance provided with quadrupole nuclei with either integer or half-integer spins to detect an NQR signal emitted therefrom, the apparatus having  
5 pulse sequence generating means adapted to produce a combination of two or more pulse sequences, arranged so that a definite regularity of the phase alteration of pulses in each of the pulse sequences occurs that is equivalent to a shift of spectral components of the pulse sequences in relation to each other, and that in at least one of the pulse sequences, there are not less than  
10 two phases alternating.
2. An apparatus as claimed in claim 1, wherein at least one of the pulse sequences contains a preparatory pulse.
3. An apparatus as claimed in claim 1, wherein the combination of two or more pulse sequences is different from a combination of PAPS and NPAPS, and  
15 none of the pulse sequences contains a preparatory pulse.
4. A method for detecting a class of substance containing quadrupole nuclei in a sample using nuclear quadrupole resonance, including the following steps:  
  
generating a combination of the steady state free precession pulse sequences, the pulse sequences consisting of pulses that contain phases of  
20 the carrier frequency chosen from a certain set of unmatched phases distributed within the interval from 0 to  $2\pi$  radian, with every sequence different from the others either by the number of phases chosen from the set, or by the sequence order inside the sequence; and  
  
irradiating the sample with said combination of the pulse sequences.
- 25 5. A method as claimed in claim 4, including generating the SSFP pulse sequences with a preparatory pulse

6. A method as claimed in claim 5, including switching on said preparatory pulse before one or several of the pulse sequences of the combination.
7. A method as claimed in any one of claims 4 to 6, including detecting nuclear quadrupole resonance signals when the combination of the pulse sequences  
5 irradiates the sample; and  
  
combining all said nuclear quadrupole resonance signals to generate the resulting signal.
8. A method as claimed in any one of claims 4 to 7, wherein the predetermined frequency of the pulse sequence is near to one of the NQR frequencies of the  
10 substances to be detected.
9. A method as claimed in claim 4, including generating the combination of the steady state free precession pulse sequences without a preparatory pulse, using a combination of two or more sequences different from a combination of PAPS and NPAPS.
- 15 10. A method for detecting a class of substance containing quadrupole nuclei in a sample using nuclear quadrupole resonance, including completing one measurement act using a combination that consists of at least two multi-pulse sequences having the same carrier frequency of the pulses, but different phase shifts between the pulses, in each sequence of the combination.
- 20 11. A multi-pulse sequence for irradiating a substance provided with quadrupole nuclei with either integer or half-integer spins to detect an NQR signal emitted therefrom, comprising a combination of two or more pulse sequences, arranged so that a definite regularity of the phase alteration of pulses in each of the pulse sequences is equivalent to a shift of spectral components of the  
25 pulse sequences in relation to each other, and in at least one of the pulse sequences, not less than two phases are alternating.

12. A multi-pulse sequence as claimed in claim 11, wherein at least one of the pulse sequences contains a preparatory pulse.
13. A multi-pulse sequence as claimed in claim 11, wherein the combination of two or more pulse sequences is different from a combination of PAPS and NPAPS, and none of the pulse sequences contains a preparatory pulse.
14. An apparatus for producing a multi-pulse sequence substantially as herein described in any one of the embodiments with reference to the drawings as appropriate.
15. A method for detecting a class of substance containing quadrupole nuclei in a sample using nuclear quadrupole resonance substantially as herein described in any one of the embodiments with reference to the drawings as appropriate.
16. A multi-pulse sequence for irradiating a substance substantially as herein described in any one of the embodiments with reference to the drawings as appropriate.